

~~(12) INTERNATIONAL APPLICATION PUBLISHED UNDER  
THE PATENT COOPERATION TREATY (PCT)~~

~~(19) World Intellectual Property Organization [WIPO] [Bar Code]  
International Bureau~~

~~(43) International Publication Date~~ June 9, 2005 (06/09/2005) ~~(10) International Publication Number~~ **PCT WO 2005/051764 A1**

~~(51) International Patent Classification<sup>7</sup>:~~ **B64D 11/06,**  
**B60N 2/65**

~~(21) International Application No.:~~ **PCT/EP2004/010986**

~~(22) International Filing Date:~~ September 28, 2004  
(09/28/2004)

~~(25) Language in which the international application was  
originally filed:~~ German

~~(26) Language in which the international application is  
published:~~ German

~~(30) Priority Data:~~  
103 51 692.1 November 5, 2003 (11/05/2003) DE

~~(71) Applicant (for all designated states except the U.S.):~~  
**RECARO AIRCRAFT SEATING GMBH & CO.**  
**KG** [DE/DE]; Daimlerstrasse 21, 74523 Schwäbisch  
Hall (DE);

~~(72) Inventor; and~~

~~(75) Inventor/Applicant (U.S. only):~~ **KRAUTH, Hubert**  
[DE/DE]; Kübelrainstrasse 51, 74535 Mainhardt  
(DE). **FORGATSCH, Oliver** [DE/DE]; Flachswie-  
senstrasse 16, 71364 Winnenden (DE). **NOWAK,**  
**Andreas** [DE]; Lilienweg 5, 71546 Aspach (DE).

~~(74) Representative:~~ **BARTELS AND PARTNER**; Lange  
Strasse 51, 70174 Stuttgart (DE).

~~(81) Designated States (unless indicated otherwise, for  
each available type of national protective right):~~ AE,  
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW,  
BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK,  
DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM,  
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ,  
LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,  
MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH,

~~[continued on next page]~~

~~(54) Title:~~ **51102**

Patent Application

of

HUBERT KRAUTH,

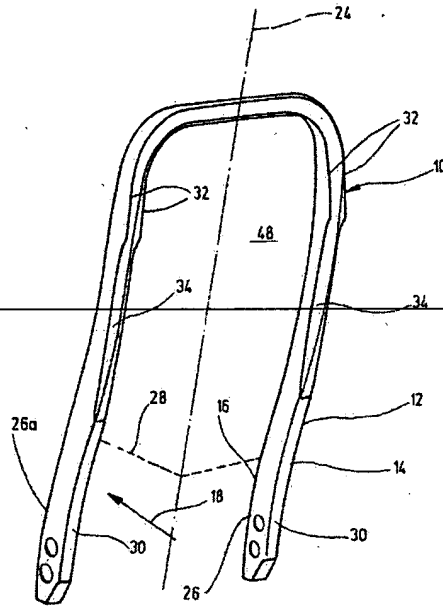
OLIVER FORGATSCH

and

ANDREAS NOWAK

for

SEAT, PARTICULARLY AN AIR PASSENGER SEAT



(57) Abstract: The invention relates to a seat, particularly an air passenger seat, comprising a seat part and a backrest, which has a backrest element (10) with an arched, one-piece frame part (12) consisting of at least one hollow profile (14). In order for the frame part (12) to have, at least in part, at least one additional hollow profile (16) and for the adjoining hollow profiles (14, 16) to be situated one behind the other in the normal direction of movement (flying direction (18)) of the seat, the backrest element is reinforced in the relevant areas in such a manner that, even in the event of a crash, the base frame structure remains intact.

(57) Zusammenfassung: Die Erfindung betrifft einen Sitz, insbesondere Fluggastsitz, mit einem Sitzteil und einer Rückenlehne, die ein Rückenlehnenelement (10) aufweist mit einem gebogenen, einstückigen Rahmenteil (12), das aus mindestens einem Hohlprofil (14) besteht. Dadurch, dass zumindest teilweise das Rahmenteil (12) mindestens ein weiteres Hohlprofil (16) aufweist und dass die aneinandergrenzenden Hohlprofile (14, 16) in üblicher Bewegungsrichtung (Flugrichtung 18) des Sitzes hintereinanderliegend angeordnet sind, ist das Rückenlehnenelement in den relevanten Bereichen derart ausgesteift, dass selbst im Crashfall die Grundrahmenstruktur erhalten bleibt.

PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ,  
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN,  
YU, ZA, ZM, ZW.

~~(84) Designated States (unless indicated otherwise, for  
each available type of national protective right):~~  
ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL,  
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG,  
KZ, MD, RU, TJ, TM), European Patent (AT, BE, BG,  
CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,  
IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI

(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,  
NE, SN, TD, TG).

**Published:**

*With International Search Report.*

*Reference is made for an explanation*

**Field of the** *two-letter codes and the other abbreviations to  
the Guidance Notes on Codes and Abbreviations in the front  
section of each regular PCT Gazette edition.* **Invention**



\_\_\_\_\_  
Recaro Aircraft Seating GmbH & Co. KG, Daimlerstr. 21,  
\_\_\_\_\_  
74523 Schwäbisch Hall

\_\_\_\_\_  
Seat, Particularly an Air Passenger Seat

The present invention relates to a seat, particularly an air passenger seat, having a seat component and a backrest ~~having~~. The backrest has a backrest element with a bent, one-piece frame component ~~consisting~~ formed of at least one hollow section.

#### Background of the Invention

DE 100 50 151 C1 discloses a backrest element for a seat fixture with a frame of wood, light metal, or plastic forming the edge outline, ~~a~~. A frame having ~~has~~, at least in some areas, a groove introduced into the narrow side of the edge ~~and a~~. A pouch-like covering is pulled over the frame, and ~~having~~ has piping which corresponds to the groove when in the use position and which is introduced into the groove inside the pouch on the covering. ~~Provision is made as~~ As additional configuration of the disclosed solution ~~such that~~, the groove receiving the piping is configured in the side edges and in the upper edge of the backrest frame ~~rest~~. ~~As additional configuration provision may be made such that the~~. The edges of the side of the frame are ~~may~~

be designed in the lower area to be offset slightly inward and to have no groove. In the disclosed solution, the backrest is configured to be curved



~~in order~~ to achieve optimum seating comfort and in particular to ~~provide~~ support for the back of a seat occupant. In addition, the frame metal is in the form of a ~~sort of~~ backrest shell with mounting surfaces for the respective fabric component mounted on the front and rear sides; ~~mounting~~. Mounting surfaces of plastic or leather or composite materials may be used in place of textiles ~~and the respective~~. The center area is clear of the backrest element so that to this extent covering of the backrest continues without additional support. Because of the elastic configuration of the ~~respective~~ cover component, the area of the back of a seat occupant is nevertheless supported safely and comfortably during the seating process.

In the disclosed solution, the cover of the backrest is guided along the side edge component element, without undesirable movement of the cover off center, since the inner piping of the cover is guided inside the piping groove. However, the disclosed solution may not be transferred to seats, such as motor vehicle or aircraft passenger seats. For one thing, the frame structure as configured is too weak to absorb the forces arising in the event of a crash. For another, there is no assurance that in the event of application of a heavy load to the backrest structure the piping component and accordingly the cover structure would not be unintentionally pulled out of the receiving groove in the side edges of the frame component, ~~something~~ resulting in ~~separation~~ of the cover from the backrest.

~~On the basis of this prior art the~~ Summary of the Invention

An object of the present invention is to ~~create~~ provide a seat having a backrest component ~~which permits~~ permitting greater safety, especially in the event of a crash.

The object as ~~thus formulated~~ is basically attained, according to the present invention, by a seat having ~~the features specified in claim 1 in its entirety~~.

~~In that, as specified in the characterizing part of claim 1, the~~ a frame component that has, at least to some extent, an additional hollow section, and ~~in that the~~ juxtaposed hollow sections ~~are~~ mounted one after the other in the customary direction of movement (direction of

flight) of the seat, ~~a sort of~~. A two-chamber hollow section solution is achieved for the bent, one-piece frame component in the relevant area, ~~something which rigidifies to make~~ the backrest element rigid in the relevant areas to the extent that the base frame structure of the backrest element is ~~more less~~ substantially preserved even in the event of a crash ~~and this~~. This structure is not unintentionally folded together nor fails in another direction harmful to the seat occupant. In addition, because of the hollow-section configuration, the rigidified solution ~~claimed for the of~~ the present invention is not made heavier than the flat contact surfaces ~~disclosed for the of the~~ conventional solution described ~~in the foregoing; this above~~. This lack of additional weight is a factor, especially if the seat ~~claimed for the of the present~~ invention is used in aircraft, ~~in which~~ where weight reduction is known to ~~result in~~ increase in the payload. ~~It has also been found that~~ Also, the covering elements needed for supplementing the backrest may be more securely fastened to the hollow-chamber section solutions ~~in question~~ than to the conventional groove-piping fastenings mounted on the sides of the frame component.

In one preferred embodiment of the seat ~~claimed for the of the present~~ invention the backrest element has the double-chamber hollow section in its lower area when in the service position, preferably in the area of the lower third of this backrest element. The rigidity ~~in question~~ of the backrest element structure is of particular importance precisely in this lower area in absorption of crash forces. Additional weight may also be conserved by not providing the double-chamber hollow section for the entire frame component, but exclusively for the area of the backrest of particular relevance to safety engineering, an area in which the backrest is hinge-connected to the point of transition to the conventional seat element so that its tilt may be adjusted.

In another especially preferred embodiment of the seat ~~claimed for of the present~~ invention, the backrest element is bent in the shape of a U, with a common chamber wall separating the adjacent hollow sections. This arrangement results to a great extent in the torsional rigidity desired for the backrest, so that the forces of the seat occupant are absorbed in each seating position reliably and comfortably for the seat occupant. A contribution to this end is also made ~~by the circumstance that~~ preferably by the cross-section selected for the hollow

section preceding in the usual direction of movement ~~is being~~ the same as or larger than the cross-section of the following hollow section.

In another preferred embodiment of the seat ~~claimed for~~ the present invention, the chamber wall of the preceding front hollow section facing in the usual direction of movement (direction of flight) is provided with a slant extending in the longitudinal direction of the backrest, ~~a~~. The slant which forms an imaginary V with the opposite slant of the other front hollow section of the U-shaped frame component. In this way, a part of the fabric element, which may be fastened to the U-shaped frame component, is supported in two dimensions by ~~way of the~~ those slants indicated, so that an effective support is obtained ~~and the~~. The fabric elements which may be received in longitudinal recesses of the hollow section provided are then deviated by more than 90°, so that undesirable removal from the fastening groove in the section is reliably prevented.

~~Other advantageous embodiments of the seat claimed for the invention are specified in the dependent claims.~~ Other objects, advantages and salient features of the present invention will become apparent from the following detailed description, which, taken in conjunction with the annexed drawings, discloses a preferred embodiment of the present invention.

~~The invention will be described in detail in what follows with reference to the drawing, in which, in~~ Brief Description of the Drawings

Referring to the drawings which form a part of this disclosure:

FIG. 1 is a diagrammatic form, not drawn to scale,

FIG. 1 presents a perspective rear view of the a one-piece frame component of the backrest bent to form a U according to an embodiment of the present invention;



~~FIGS. 2 and 3 present~~ is a perspective top view of a cross-section of the two-chamber hollow section of the backrest frame component shown in FIG. 1, in one instance with a piping section being used and in the other instance a fastening wire or rod in order to fasten a cover element on the backrest element indicated; and

FIG. 3 is a perspective top view of a cross section of the two-chamber hollow section of the backrest frame component of FIG. 1, with a fastening wire or rod to fasten a cover element on the backrest element.

### Detailed Description of the Invention

A modern aircraft passenger seat of the latest generation is described, for example, in DE 100 19 484 ~~submitted by this applicant.~~ (corresponding to U.S. Patent No. 6,769,739). The ~~disclosed solution in DE 100 19 484~~ relates to an aircraft passenger seat having a seat element and a backrest ~~which are~~ held so as to be movable in relation to each other by ~~way of~~ at least one adjustment unit, ~~the respective.~~ The adjustment unit having several articulations ~~which are~~ connected to each other at least in part by ~~way of~~ a bar support structure with individual bar components which hold the seat element upright in relation to a floor of a motor vehicle or aircraft. By ~~means of~~ an actuating unit, the components of the aircraft passenger seat are made to execute positioning movements by which the seat component may be moved from an initial position to at least one other position and back. In addition to the seat component, the other components of the seat such as foot and leg support and backrest may be positioned at a large number of freedom of movement degrees so that, in addition to various comfort positions, a rest position is reached for the seat occupant, ~~one in which.~~ In the rest position, the backrest is made by a restraint, as a result of tilting movement of the bar support structure, to follow the inclination of the seat component so that an inclined rest surface is formed for the seat.

The backrest element 10 described ~~in what follows~~ herein and illustrated in the figures is ~~to be preferably used by preference~~ for aircraft passenger seats configured for this purpose with a seat component 11. The backrest element 10 ~~in question~~ is outfitted with a one-piece frame component 12 bent so as to assume the shape of a U and ~~consisting~~ is formed of at least one first

or rear hollow section 14. In addition to this first hollow section 14, the frame component has at least in part another second or front hollow section 16. The adjoining hollow sections 14, 16 are mounted so as to be positioned one behind the other in the customary direction of flight of the seat (flight direction 18). The respective flight direction 18 is indicated by an arrow in FIG. 1.

When the seat is in the service position, as illustrated for the back element 10 in FIG. 1, ~~this back~~ element 10 has the double-chamber hollow section 14, 16 in the area of its lower third. ~~As is to be seen~~shown in FIGS. 2 and 3 in particular, a common chamber wall 20 separates adjoining hollow sections from each other. ~~As is also to be seen in~~In FIGS. 2 and 3, the cross-section of the hollow section 16 which is in front in the customary direction (direction of flight 18) is the same size as or larger than the cross-section of the following hollow section 14. The chamber wall facing in the direction of the customary direction of movement (flight direction 18) of the preceding front hollow section 16 is provided with a bevel 26 extending in the longitudinal direction 24 of the backrest. This bevel 26 forms with the opposite bevel 26a of the other front hollow section 16 of the U-shaped frame component 12 an imaginary V 28, ~~the~~. The bevels 26, 26a ~~of the respective~~by their imaginary ~~extension meeting~~extensions meet in the area of the longitudinal direction or axis 24 of the backrest. The cross-sections ~~in question~~ of the two hollow sections 14, 16 are otherwise configured to be more or less square or rectangular ~~and the~~. The corners of the respective section 14, 16 preferably are rounded.

~~As is also to be seen~~ in FIG. 1, the rear hollow section 14 is in the clear, especially in the upper third of the section wall 30 opposite the bevel 26, 26a, so that there remain in this area more or less only the web walls 32 extending in parallel with each other, ~~which~~. The web walls are cut back even further in the direction of the chamber wall 20 in the upper closing area of the frame component 12. ~~In order to~~To make room for reception of a table component (not shown) which may be folded so as to be integrated into the backrest, in the rear area of the ~~latter~~backrest, a corresponding recess 34 is made in the central third of the frame component 12 ~~in such a way~~ that the web walls 32 are also cut back as far as the chamber wall 20 ~~referred to~~.

To the extent that the web walls 32 remain in the area of the upper two-thirds of the frame component 12, they also contribute to this extent also to stabilization of the entire backrest element 10. As is shown in the illustrations in FIGS. 2 and 3, the respective bevels 26, 26a are each delimited on the edge side by a longitudinal duct 36, 38 ~~which extends~~ extending into the interior of the other hollow section 16 and accordingly ~~is integrated~~ into it. The longitudinal ~~duct~~ ducts 36, 38 ~~is~~ are ring-shaped in cross-section, and, in the direction of ~~the 26, 26a~~ communicates ~~bevels 26, 26a, communicate~~ with the exterior by ~~way of~~ a strip opening 40. The longitudinal ducts 36, 38 ~~in question~~ serve either to receive a piping section 42 (see FIG. 2) or to receive a bar or wire section 44 (see FIG. 3).

A cover component 46 such as one in the form of a net, as shown in FIGS. 2 and 3, or in the form of a cover fabric, leather cover, or the like (not shown) may be fastened on the backrest element 10 by ~~means of~~ the sections 42, 44 ~~in question~~. For this purpose, the piping section 42 may be configured as a plastic section strip ~~which may be connected~~ to the cover component 46 by ~~means of~~ an adhesion or extrusion process. In ~~the solution illustrated in FIG. 23,~~ the cover component 46 is wrapped around the bar or wire section 44 and fastened by clamping in the associated opening 40. In that two longitudinal ducts 36, 38 are present in the area of the bevels 26, 26a, the duct 38 on the left as viewed in ~~the line of sight to~~ FIGS. 2 and 3, for example, may serve to receive the net as cover component 46, and the right duct 36 ~~to~~ may receive a cover material or a leather cover component, which in turn is fastened as is the net and then overlaps this net toward the exterior.

As a rule, the longitudinal ducts may also be positioned in the area of the rear hollow section 14 ~~in order thus~~ to participate in covering the double-chamber hollow section ~~of the~~ respectively by another cover component (not shown). In any event, the bevels 26, 26a ~~in question~~ provide a level surface for application of the cover component 46 extending over the bevels, so that improved support is achieved to this extent. The ~~bevel~~ bevels 26, 26a also permits deflection of the respective cover component by more than 90° with respect to the outer longitudinal duct as viewed in ~~the line of sight to~~ FIGS. 2 and 3, so that greater diversion of force is achieved, ~~and this~~. This arrangement also makes certain that the respective cover component 46 may not be

pulled out of the longitudinal duct 36 by ~~way of~~ the associated end section 42, 44. The cover component 46 ~~in question~~ extends over the clear area of the frame component 12, and thus, is limited by the ~~latter~~ frame component on the edge side.

The ~~solution claimed for the present~~ invention need not be limited to use in aircraft passenger seats but as a rule may be applied to any seat, in the area of motor vehicles as well, ~~and~~. It is especially well suited in instances in which high rigidity accompanied by low weight is desired. By preference, the hollow-chamber section is obtained by a conventional extrusion process.

While one embodiment has been chosen to illustrate the invention, it will be understood by those skilled in the art that various changes and modifications can be made therein without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

## SEAT, PARTICULARLY AN AIR PASSENGER SEAT

### Abstract of the Disclosure

A seat, particularly an air passenger seat, includes a seat part and a backrest. The backrest has a backrest element (10) with an arched, one-piece frame part (12) having at least one hollow profile (14). In order for the frame part (12) to have, at least in part, at least one additional hollow profile (16) and for the adjoining hollow profiles (14, 16) to be situated one behind the other in the normal direction of movement (flying direction (18)) of the seat, the backrest element is reinforced in the relevant areas in such a manner that, even in the event of a crash, the base frame structure remains intact.